



NASA Flight Opportunities

Suborbital Flight for Advancing In-Space Manufacturing Technology

Hantang Qin, Ph.D., Iowa State University / University of Wisconsin – Madison
Curtis Hill, Senior Materials Engineer, NASA's Marshall Space Flight Center


Community of Practice Webinar Series – June 1, 2022

Session will start at 10 a.m. PT – Please mute your microphone and turn off your camera

www.nasa.gov

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Welcome to the Community of Practice Webinar Series!

First, a bit of housekeeping...

- Please mute your microphone and turn off your camera
- Today's session will be recorded
- Recordings for this and all future session will be posted on the Flight Opportunities website
- Please engage!
 - Use the chat throughout the session to ask questions

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Flight Opportunities Mission

The Flight Opportunities program facilitates **rapid demonstration** of promising technologies for space exploration, discovery, and the expansion of space commerce through **suborbital testing with industry flight providers**.




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Join us for future Community of Practice webinars!

Watch our website and newsletter for next month's topic

[nasa.gov/directorates/spacetech/flightopportunities/newsletter](https://www.nasa.gov/directorates/spacetech/flightopportunities/newsletter)

Future webinars

- Webinars are held 1st Wednesday of each month at 10 a.m. PT
- Topics will be announced in the Flight Opportunities newsletter and website
- Session recordings will be posted on the Flight Opportunities website
- Let us know session topics you would like to see covered

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Upcoming Opportunities

NASA TechFlights 2022

- Provides up to \$750K for testing space technologies in relevant environments through flights on U.S. commercial suborbital rockets, rocket-powered lander vehicles, high-altitude balloons, and aircraft following reduced-gravity flight profiles, as well as for payloads hosted on commercial orbital platforms.
- STMD is strongly committed to ensuring that proposal review is performed in an equitable and fair manner that reduces the impacts of any unconscious bias. To this end, this year's TechFlights solicitation will employ a **dual-anonymous peer review (DAPR) process**.

Key Dates

- Mandatory Preliminary Proposals due: June 2, 2022
- Full proposals (by invitation only) due: August 29, 2022



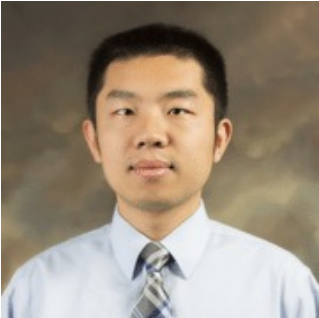
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Today's Speakers



Hantang Qin, Ph.D.
Assistant Professor
Iowa State University
University of Wisconsin – Madison



Curtis Hill
Senior Materials Engineer
NASA's Marshall Space Flight Center

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Flight Opportunities Community of Practice June Webinar
10:00 a.m. - 11:00 a.m. PDT

Suborbital Flight for Advancing In-Space Manufacturing Technology

Team

Hantang Qin, Ph.D., Assistant Professor, University of Wisconsin
– Madison, Iowa State University, Email: hqin52@wisc.edu

Curtis Hill, Senior Materials Engineer, NASA's Marshall Space Flight Center

Shan Jiang, Ph.D. Iowa State University, and all postdoc scholars/students who contributes to the success of the project!



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Our team & overall impression

- FULL OF challenges!
- Exciting, but exhausting!
- Will we do again?
- **Absolutely yes!**

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Brief overview of technology and flight objectives

- Electrohydrodynamic Inkjet Printing
 - **EHD printing**
 - Use electrical forces to drive liquid-ink flow
 - Non-gravity 2D/3D printing
- First-ever zero-gravity validation of EHD printing
- Research in the lab → impacts on NASA missions
 - From TRL 2-3 to TRL 3-5

1st Generation Printer in Dec, 2021

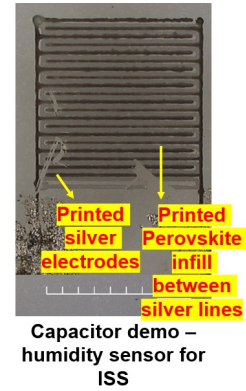
2nd Generation Printer in May, 2022:
Ready for sale

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Impressions of the flight

- Our preparation
 - From back-of-truck to flight test & a large team to backup



- How did the flight go? Did it meet your needs?
 - Overall, both are successful [Dec 7-9, 3-day] [May 18-19, 2-day three rounds]
 - Supports from Zero-G, and NASA are outstanding!
 - Concepts validation finished
 - Move our technology to the next few TRL levels
 - Interesting phenomena identified, develop more inks, automation
 - Surprises????



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Curtis Hill | June 2022

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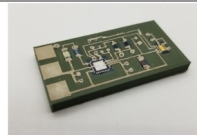


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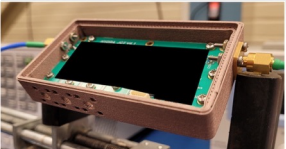


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ODME Processes in Development



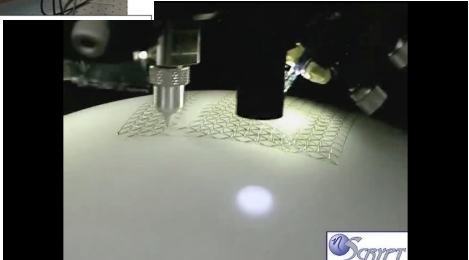
ODME demonstration of an additively-printed multilayer CO₂ sensor (Planned ISS Demo)



HYDRA Node Housing 3D-printed with copper-composite filament



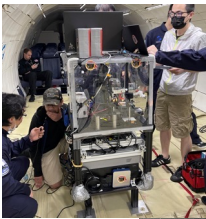
FabLab Printer Module and Advanced Toolplate




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ODME Flight Tests


- **Parabolic flights of Thin Film Deposition development November / December 2021 & May / June 2022**
 - **Space Foundry Inc.** – demonstration of Plasma Jet Deposition – SBIR Phase III and Flight Opportunities
 - **Iowa State University** – demonstration of Electrohydrodynamic Inkjet Deposition – Flight Opportunities / EPSCoR
- **Sounding Rocket flight test** of printed electronics and printed sensors planned in September 2022. Collaborative project with GSFC and Wallops with GSFC ODME team as lead.



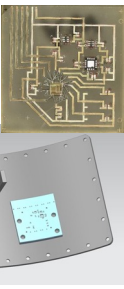
Iowa State Electrohydrodynamic Inkjet



Space Foundry Plasma Jet




Sounding Rocket Test Flight



Printed electronics & sensors on door

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Thank you!

Flight Opportunities website:
<http://nasa.gov/flightopportunities>

Contact us:
NASA-FlightOpportunities@mail.nasa.gov



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